



# ***Evaluation of the Proposed California Independent System Operator Energy Imbalance Market (CAISO EIM)***



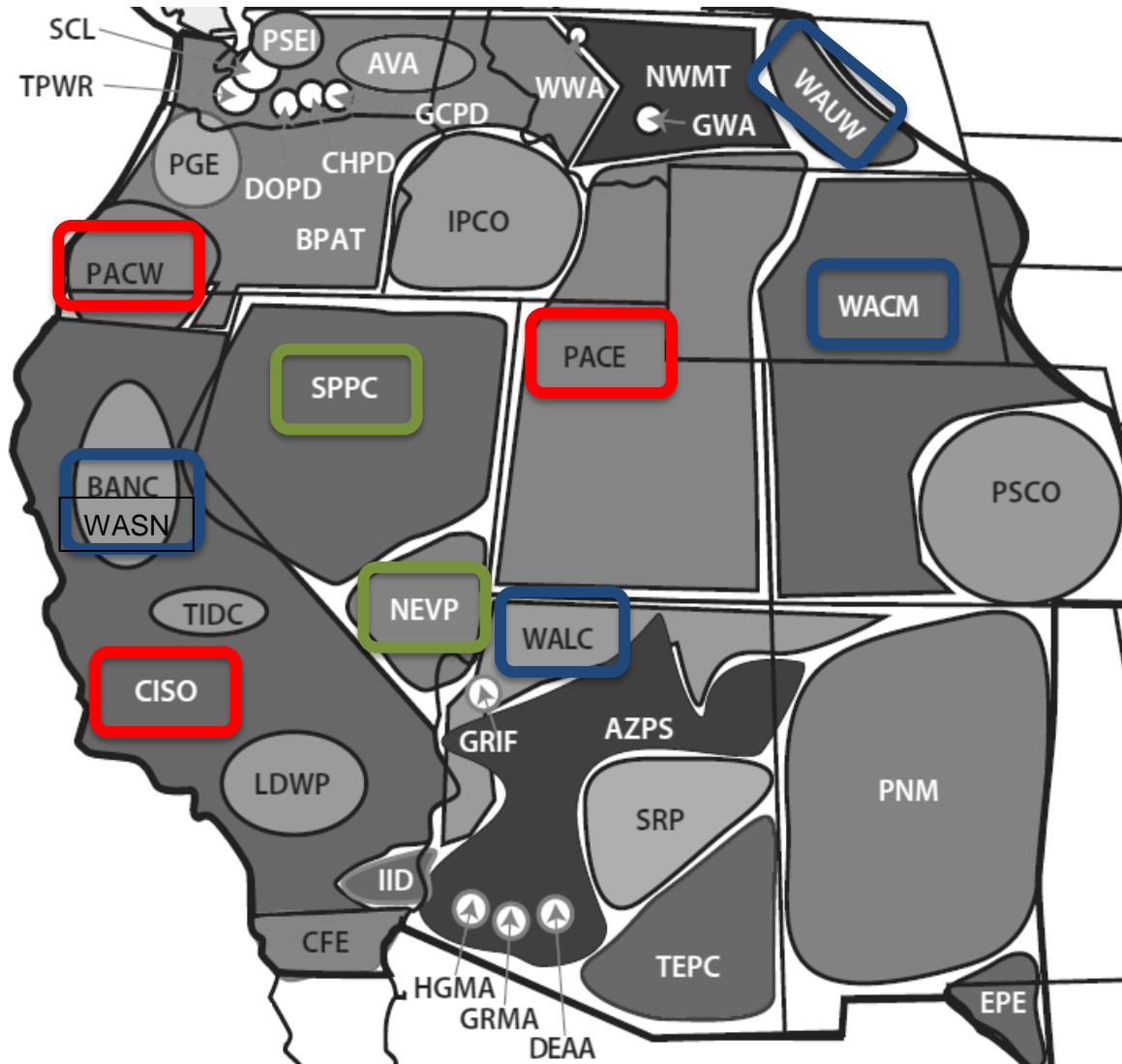
**Presented at the  
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Customer Meeting  
Desert Southwest Office  
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**presented by**

**Thomas Veselka and Todd Levin  
Argonne National Laboratory**



# Western Asked Argonne to Perform a Preliminary Investigation of the Potential Impacts of the CAISO EIM



**CAISO EIM Opens in October 2014 with PACE and PACW BAs**

**NV Energy plans to join<sup>1</sup> the EIM in the autumn 2015 (SPPC & NEVP BAs)**

**Others have expressed interest**

**Argonne studied potential CAISO EIM Impacts on Western BAs & sub-BA**

# Western Energy Imbalance (EI) Synopsis

- Deviations of actual values from scheduled levels
- Typically, but not always relatively small
- Increase with higher Variable Energy Resources (VERS)

## Western 2012 Annual Average Net Imbalance (% of load)

BA	Annual Excess (GWh (% of load))	Annual Deficit (GWh (% of load))
WALC	62.8 (0.49%)	46.5 (0.36%)
WACM	221.1 (0.93%)	102.5 (0.43%)
WASN	26.3 (0.62%)	25.3 (0.62%)

## Resolving EI

### Current Practice

### CAISO EIM

#### Footprint

Single BA

Multiple BAs

#### Balancing

Federal Resources  
and Purchase

Optimize Participating  
Resources Dispatch

#### Time Step

Hourly

Hourly, 15 min, 5 min

#### Settlement

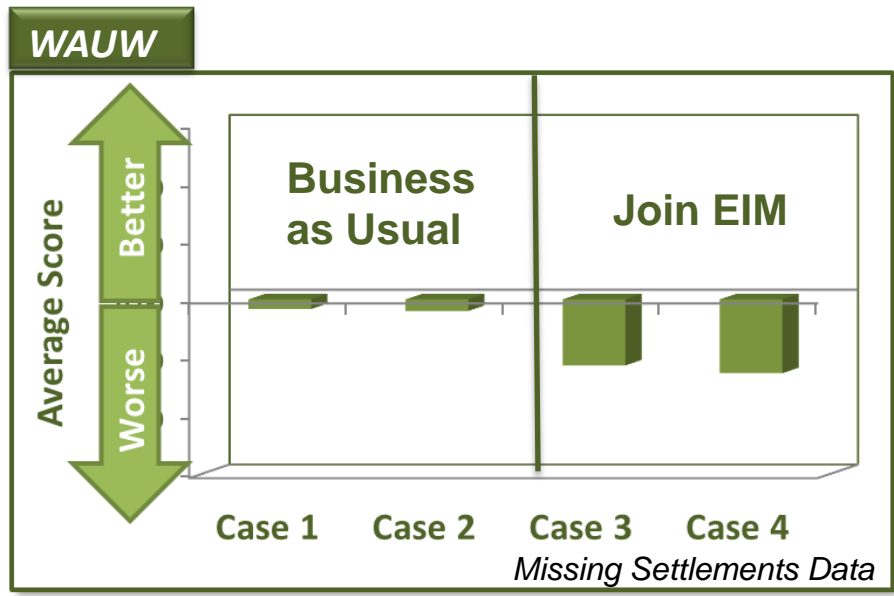
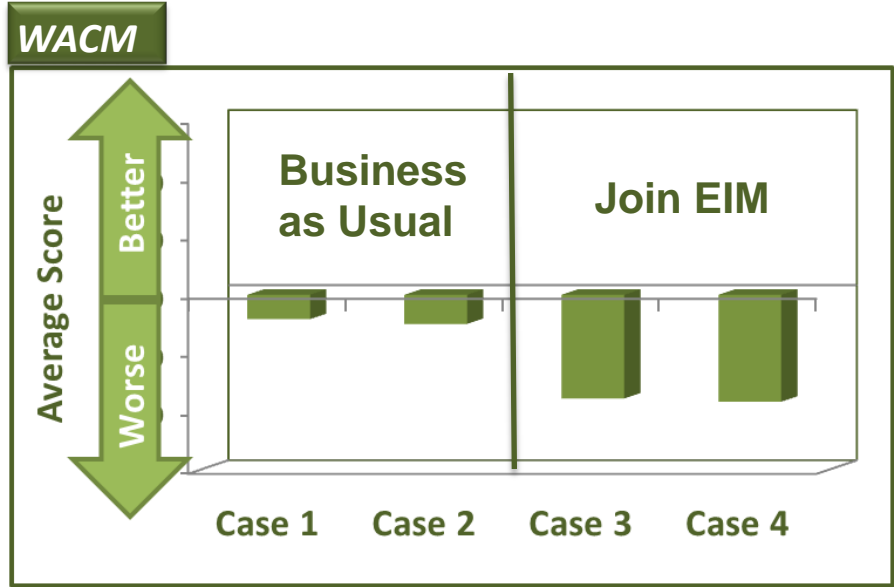
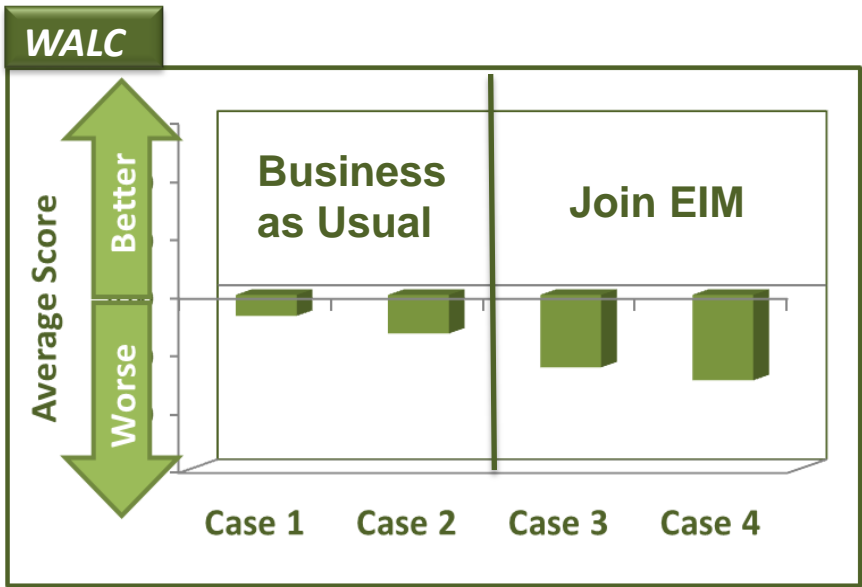
Financial or  
Energy Payback

Locational Marginal Price  
(LMP) & Neutrality Accounts

# Argonne Study: Purpose and Process

- **Provide preliminary insights into future operations**
  - Address questions concerning evolving grid and market issues
  - Evaluate business cases that could potentially occur in the future in terms of benefits, costs, and suitability for Western
  - Explore alternative structures to the CAISO EIM
- **Future business cases include:**
  - **Case 1:** Business-as-usual, surrounding BAs join the EIM, current VERs
  - **Case 2:** Business-as-usual, surrounding BAs join the EIM, higher VERs
  - **Case 3:** Western BAs join the EIM, current VERs
  - **Case 4:** Western BAs join the EIM, higher VERs
- **Evaluation process**
  - Discuss cases with subject matter experts (SMEs)
  - SME groups from 6 business areas provided subjective scores
  - SMEs estimated ranges of startup and ongoing annual costs
  - Compiled and analyzed historical energy imbalance (EI) data

# SMEs Subjective Scores on Future Operations



*Average over the 6 business areas for startup, business process, and risks*

# The CAISO EIM Design Is not Well Suited for Western

## ■ Participation will most likely be very limited

- Federal resources are contractually committed to customers
- Water delivery obligations and environmental operating criteria further limit Western's ability to respond to market price signals
- Would require USBR participation with additional cooperation and coordination
- GHG emission issues associated with energy sales into California

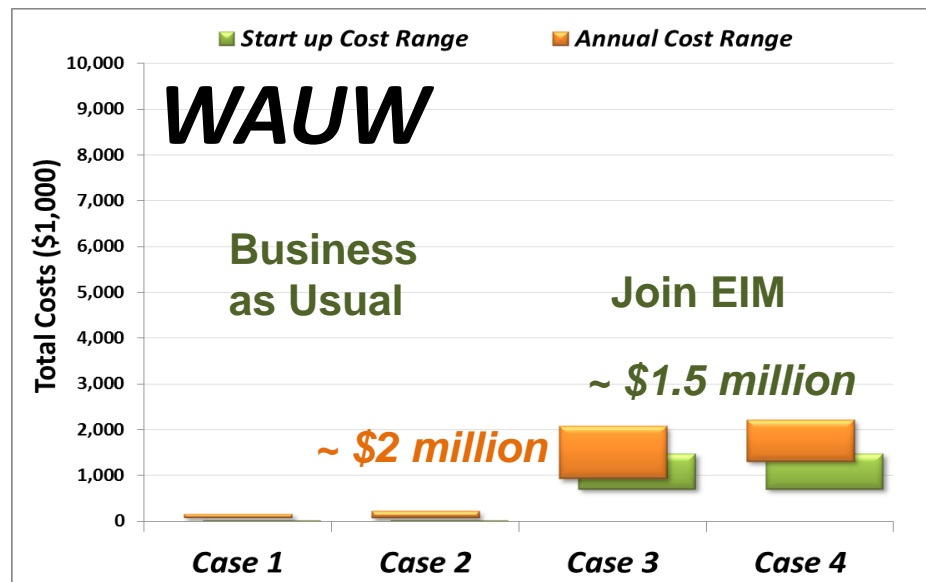
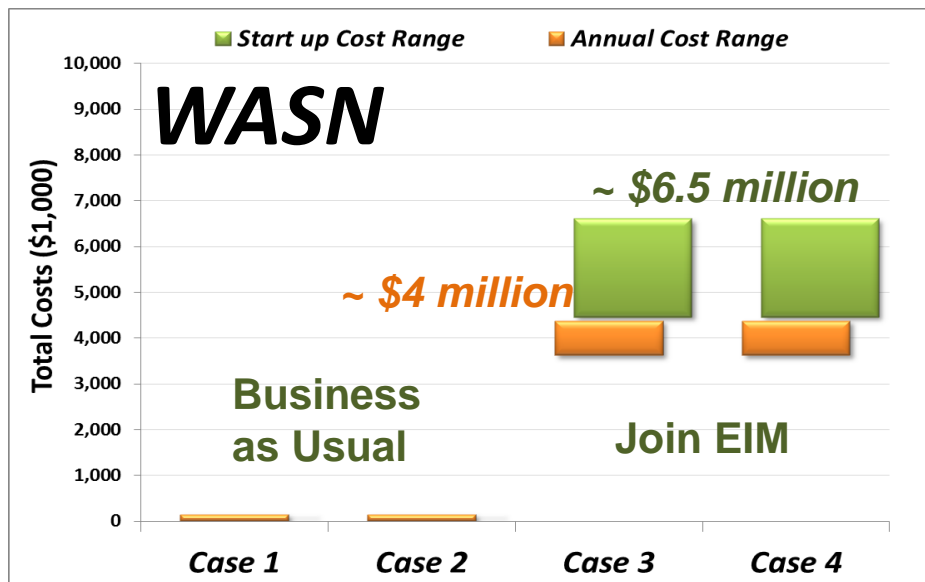
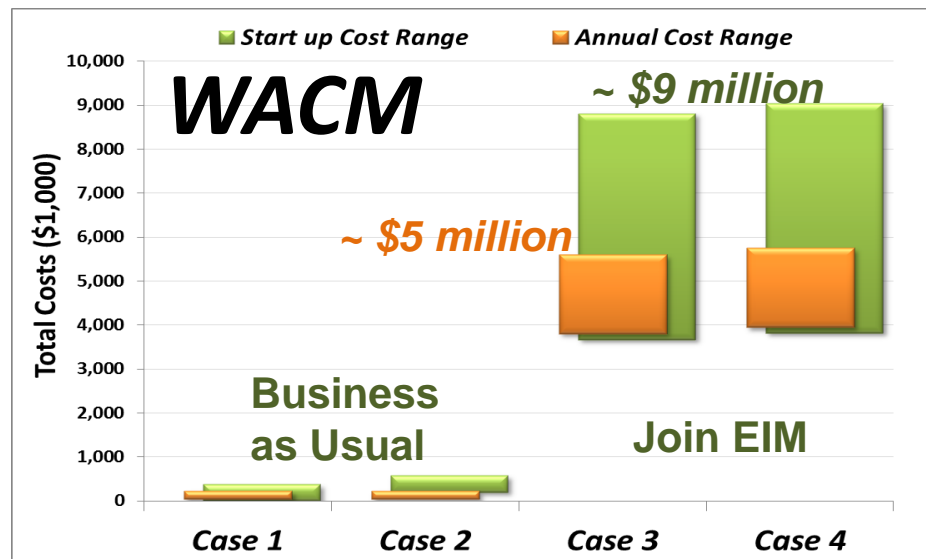
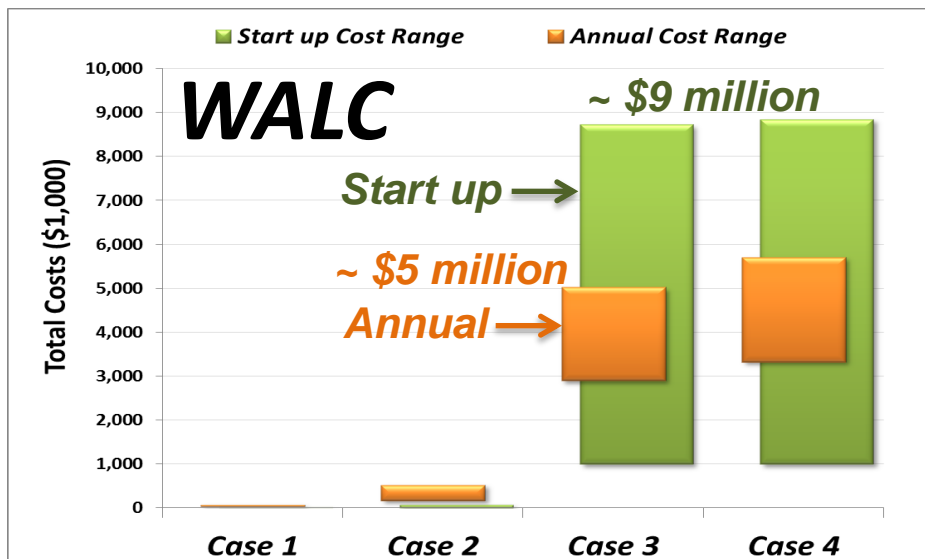
## ■ Participation will most likely be expensive

- High startup costs for new hardware, software, training and to establish new organizational structures, policies and procedures
- Require new public processes
- Ongoing EIM operational costs are expensive requiring additional staff and higher maintenance expenditures
- CAISO participation fees

## ■ Participation will most likely increase risks

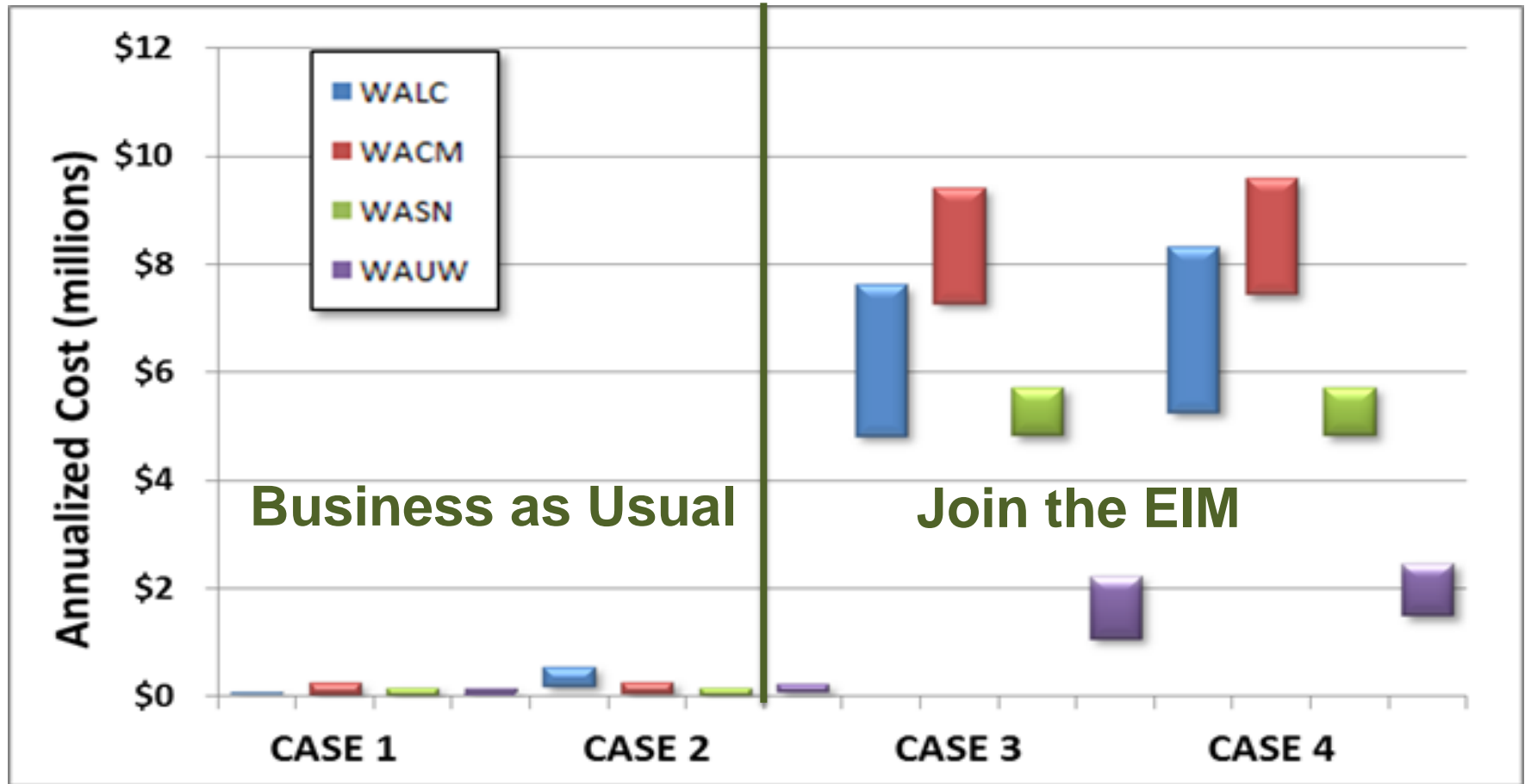
- Potentially subject to high prices and generation imbalance costs
- Excluded from market for security purposes or communication failure
- Little or no control over meeting EIM resource sufficiency requirements

# Total Internal "Ballpark" Startup & Ongoing Costs



Cost for Western to preform a set of EIM Tasks as defined by CAISO

# Estimated Annualized Costs Include Internal Costs & Fees



*Based on a 2% real discount rate levelized over a 20 year period*

*Some costs savings would be realized if multiple BAs joined; therefore costs should not simply be summed*



# Simplistic WACM Breakeven Analysis

- WACM ballpark EIM annual cost increase ranges from \$7.2 to \$9.2 million
- The total WACM energy imbalance in 2012 was 323.6 GWh
- Dividing the cost by energy amount yields 22.39 to 28.37 \$/MWh
- Average LMP price index at Palo Verde in 2012 was 24.85 \$/MWh

Imbalance (GWh)		Index Price (\$/MWh)	Settlement Cost w/o EIM (\$1000)
Short (buy)	102.5	\$24.85	-\$2,547
Long (sell)	221.1	\$24.85	\$5,494
			\$2,947

Index – \$22.39

Imbalance (GWh)		EIM Price (\$/MWh)	Settlement Cost w/ EIM (\$1000)
Short (buy)	102.5	\$2.46	-\$253
Long (sell)	221.1	\$47.24	\$10,444
			\$10,191

Index + \$22.39

Increased Net Revenue = \$7.2 Million  
= Cost

- Western would need to engage in much large transaction volumes and/or reduce its EIM costs to make the EIM financially attractive
- Contractual commitments, water delivery obligations and environmental operating criteria make it difficult for Western to participate at even very modest levels (e.g., to serve only internal EI)
- EIM cost reduction may be possible by centralizing EIM related activities

\*Analysis is for Case 3, current VERs

# The Break-even Analysis for other BAs Is Less Attractive

Money Western would need to save to breakeven

Required cost improvement relative to index price

## WACM

2012 Imbalance (GWh)	Annualized Cost (\$1000)	Breakeven Point (\$/MWh)
Total Imbalance 323.6	Low \$7,244	Low <b>\$22.39</b>
	High \$9,180	High <b>\$28.37</b>

Additional revenues needed via higher sale and/or lower purchase prices relative to the net costs of settling imbalance without joining the EIM

## WALC

2012 Imbalance (GWh)	Annualized Cost (\$1000)	Breakeven Point (\$/MWh)
Total Imbalance 109.4	Low \$4,781	Low <b>\$43.71</b>
	High \$7,543	High <b>\$68.95</b>

## WASN

2012 Imbalance (GWh)	Annualized Cost (\$1000)	Breakeven Point (\$/MWh)
Total Imbalance 51.6	Low \$4,830	Low <b>\$93.61</b>
	High \$5,574	High <b>\$108.02</b>

## 2012 Palo Verde LMP (\$/MWh)

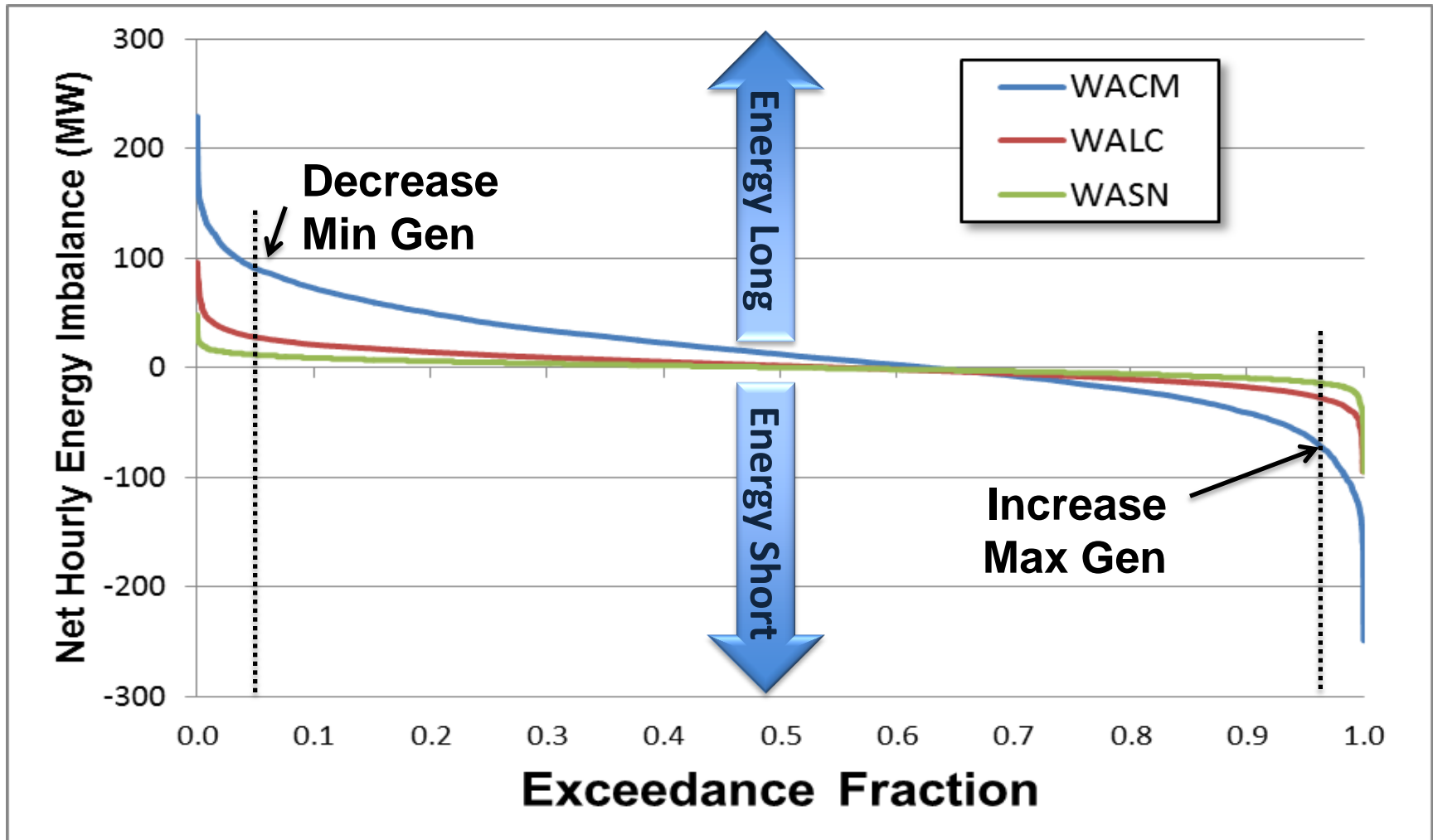
Max	157.76
99%	54.48
90%	35.37
75%	29.20
50%	24.07
25%	20.04
10%	15.52
1%	-3.51
Min	-30.00

Ave **24.85**

\*Analysis is for Case 3, current VERs

WAUW: only performs monthly net accounting

# *“IF” the EIM Resolved BA Imbalances .....*



- *Free hydropower capacity for other purposes*
- *Wider operating range*

# CAISO EIM May Be more Beneficial for Some Entities Located within Western's BAs

- **The EIM is best suited for utilities that have:**
  - Flexible resources and/or excess capacity for bidding into the EIM
  - Variable energy resources
  - Frequently start and/or run high-cost peaking resources
- **If Western joins the EIM it will impact all entities within the BA including those that decide not to participate**
  - Additional reporting responsibilities
  - Subject to EIM energy imbalance accounts and settlements

**Risk: Reshuffling of entities within BAs may occur if Western either joins or does not join the EIM**

# Possible Design Goal of an CAISO EIM Alternative

- **Goals of the CAISO EIM are theoretically sound**

- Shorter scheduling and dispatch intervals
- Expanded resource pool and larger dispatch footprint
- Greater diversity, wider and more refined grid visibility, etc.

**Is there a “better” method of achieving these goals for Western other than process and rules proposed by the CAISO EIM?**

- **Simplify**

- The CAISO is very complex and complicated substantially increasing costs and reducing transparency

- **Economic savings**

- Focus shift from financial bidding markets to reduction in overall grid costs

- **Share gains**

- The EIM will produce winners sometimes at the expense of others
- Ideally, all, including load serving entities, should share economic gains

- **Incorporate long-term goals into the process**

- Develop long-term development strategies to achieve least-cost solutions

# ANL Recommended Next Steps for Western

- Continue to monitor the activities of the CAISO EIM and WI market related initiatives
- Continue to work with and inform customers about market related activities
- Western may want to consider becoming even more proactive when dealing with industry changes
- Develop market design concepts in consultation with DOE and key customers that more closely match its objectives
  - Brainstorm to refine and fully define range of potential market structures
  - Alternatives should focus on equitable designs that result in positive overall net benefits for all entities
- A perfect “one-size-fits-all” market design does not exist
  - Each Western office/BA and its customers are unique
  - Requires market participant to compromise on specific design components

**Thank you for  
your attention**